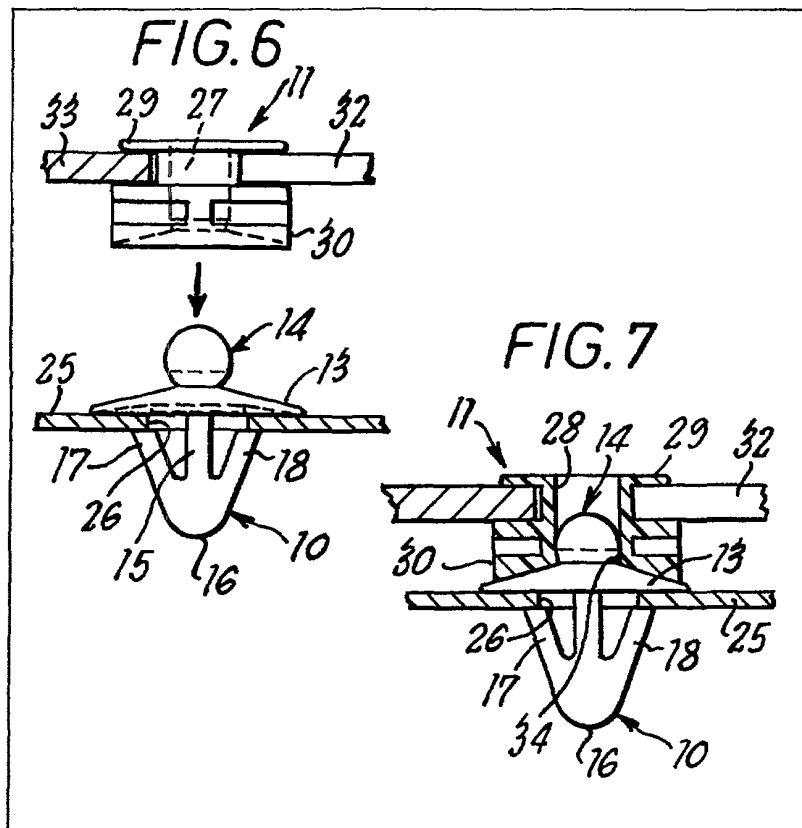


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 E2A  
 (71) Applicants  
 United-Carr Limited,  
 Buckingham Road,  
 Aylesbury,  
 Buckinghamshire,  
 HP19 3QA.  
 (72) Inventors  
 Barry Roger Michael  
 Barnett  
 (74) Agents  
 R.G.C. Jenkins & Co.,  
 Chancery House,  
 53/54 Chancery Lane,  
 London, WC2A 1QU.

(54) Two part fastener

(57) A two-part fastener comprises a stud portion (10) and a socket portion (11) for attaching two members together such as a trim pad to a vehicle panel. The stud portion has an anchor (15) for attaching it to a first panel member (25) and a generally spherical stud element (14). The socket portion has a constricted bore (28) adapted to receive the stud (14) with snap action and means (29) for attaching it to a second member (32). Either the stud or the socket or both may be resilient.



The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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FIG. 1

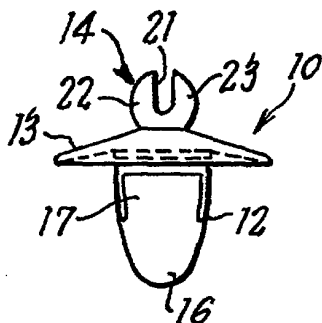


FIG. 2

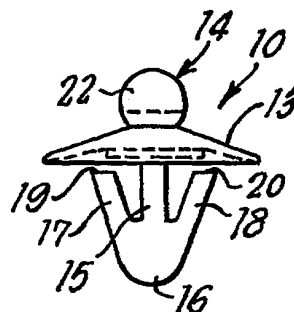


FIG. 3

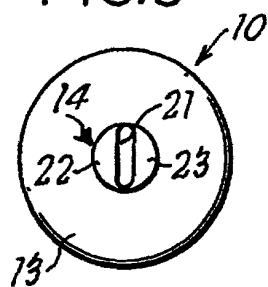


FIG. 4

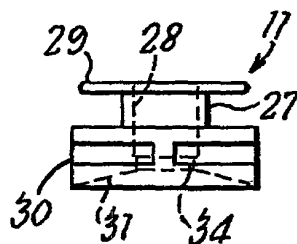


FIG. 5

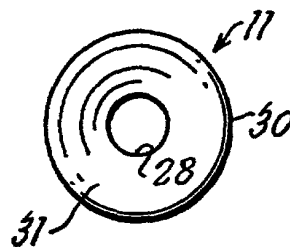


FIG. 6

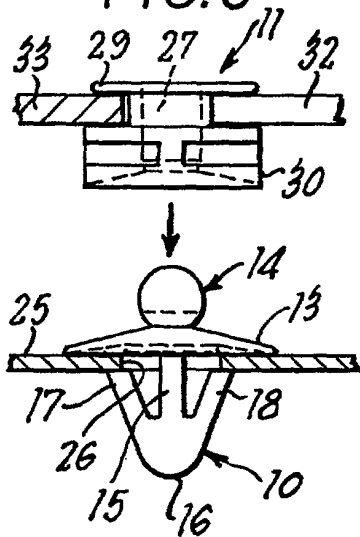


FIG. 7

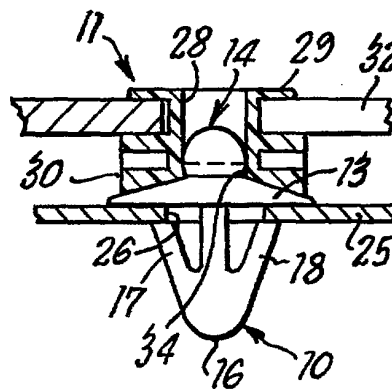


FIG. 8

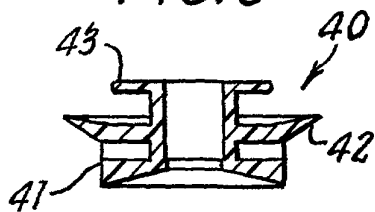


FIG. 9

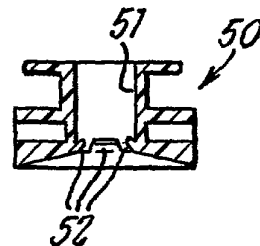


FIG. 10

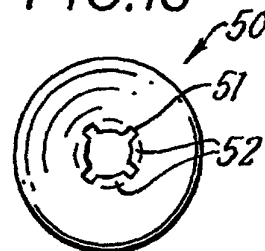
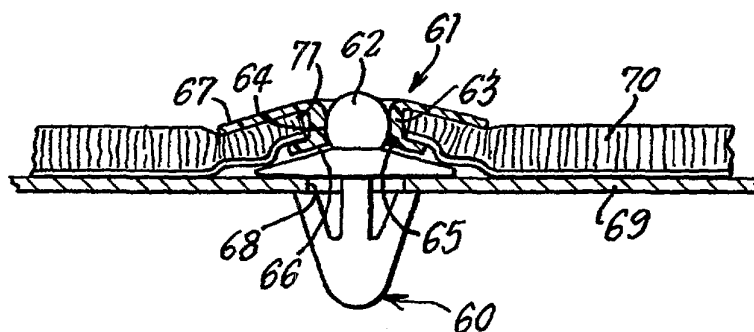


FIG. 11



## SPECIFICATION

## Two part fastener assembly

5 The present invention is concerned with a two part fastener assembly for attaching two panel or sheet elements together, for instance for attaching a vehicle trim pad or floor covering to a supporting panel which forms a part of the vehicle body.

10 In the vehicle industry it is the practice to attach trim pads to the inside of the door and body panels of the vehicle with the aid of a plurality of clips or fasteners. One of the most successful forms of vehicle trim pad fastening used hitherto comprises a one piece fastener having a nose or stud portion which is inserted into a hole in the support panel and a head portion which is attachable in a key-hole slot in the trim pad. The stud or nose portion of this type of fastener is resilient and removably attached in the hole in the support panel and the head of the fastener is slideably engaged in the keyhole slot in the trim pad. In order to mount the trim pad on the vehicle panel, the fasteners are first attached to the trim pad, the trim pad is then brought up to the support panel and the projecting nose or stud portions of the fasteners are pressed home into the holes in the support panel. If it is necessary to remove the trim pad for repair, this is done by applying sufficient force to withdraw the nose or stud portions of the fasteners from the holes in the support panel.

This known type of vehicle trim pad fastening has a number of disadvantages. When the trim pad is brought up to the support panel, there is little tolerance provided for the positioning of the holes in the support panel. If one or more of these holes is slightly out of position it becomes impossible to apply the trim pad and a failure will occur in the assembly operation. There is also little, if any, tolerance allowed for in the size and shape of the holes in the support panel. If the size of these holes is not correct, to within very small tolerances, then the nose or stud portion of the fastener will not grip the support panel properly or alternatively will break as it is forced into the hole. Problems can also arise when it is necessary to remove the trim pad panel from the support panel. If the panel hole is not accurately formed to small tolerances the nose or stud portions of the fasteners will break or the trim pad itself will be damaged, as frequently occurs when too great a force has to be applied. If the latter occurs, the complete assembly of trim pad and fasteners must be replaced by a new one.

It is therefore an object of the present invention to provide a two part fastener assembly which can be used to attach a vehicle trim pad to a support panel so that the trim pad is readily removable numerous times from the support panel at a generally constant applied force (the "peel force") which may be e.g. 20 to 40 lb and reattachable to the support panel.

It is a further object of the present invention to provide a fastener for this purpose which allows for a reasonable tolerance in the diameter of the holes in the support panel, the shaping of the holes in the support panel and the positioning of the holes in the

support panel relative to the trim pad without unduly affecting the ease with which the trim pad can be mounted on and removed from the panel.

In one embodiment of the present invention, we provide a two part fastener comprising a stud portion and a socket portion, the stud portion having attachment means for attaching the stud portion to a first panel member and a connecting element and the socket portion having a bore adapted to receive the connecting element and attachment means for attaching the socket portion to a second member, wherein the connecting element is generally spherical, the bore in the socket portion has a constricted portion and the maximum diameter of the connecting element is greater than the minimum diameter of the constricted portion of bore so that the connecting element is a force fit in the bore.

The bore in the socket portion may have a generally cone shaped entrance, the maximum diameter of which is greater than the maximum diameter of the connecting element to serve as a guide for the connecting element when the socket portion is brought up to the connecting element.

The connecting element may be resiliently compressible and in a preferred embodiment is divided by a slot into two resiliently deflectable portions. Alternatively the constricted portion of the bore in the socket portion may be resiliently expansible, in which case the connecting element may be solid and therefore relatively rigid.

The attachment means on the socket portion may comprise a flange adapted to limit insertion of the socket portion through the aperture in the second member or, alternatively, may comprise two spaced flanges adapted to slideably mount the socket portion in a slot in the second member.

The attachment means on the stud may comprise a shank adapted for insertion through an aperture in the first panel member and a flange adapted to limit insertion of the shank through the aperture, and the shank may be so designed that it is non-removable from the aperture.

Both the socket portion and the stud portion are preferably formed from a synthetic plastics material as integral injection mouldings and the socket and stud portions may initially be connected together by easily frangible web elements.

Preferred forms of the present invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is an elevation of the stud portion of a two part fastener according to the present invention;

Figure 2 is a side elevation of the stud portion shown in Figure 1;

Figure 3 is a top plan of the stud portion shown in Figures 1 and 2;

Figure 4 is an elevation of the socket portion of the fastener;

Figure 5 is an underplan of the socket portion shown in Figure 4;

Figure 6 is an elevation showing the stud and socket portions of Figures 1 to 5 mounted respectively in a trim pad and in a support panel;

Figure 7 is an elevation partly in section showing the stud and socket portions attached together to

mount the trim pad on the support panel;

*Figure 8* is a section through a socket portion forming a modification of the socket portion shown in *Figures 4* and *5*;

*Figure 9* is a section through a further modification of the socket portion;

*Figure 10* is an underplan of the socket portion shown in *Figure 9*;

*Figure 11* is an elevation partly in section showing stud and socket portions of yet a further modification of the two part assembly of the present invention attaching a carpet to a vehicle floor panel.

In *Figures 1* to *7* of the drawings, the stud portion of a two part fastener assembly according to the present invention is indicated generally at *10* and the socket portion is indicated generally at *11*. Both the stud portion *10* and the socket portion *11* of the two part assembly are formed from a suitable synthetic plastics material as injection mouldings.

The stud portion *10* comprises a shank *12*, a sealing skirt *13* and a connecting element *14*. The shank *12* comprises a stem *15* terminating in a nose *16* and two legs *17* and *18* which extend rearwardly and outwardly from the nose *16* towards the skirt *13*. The legs *17* and *18* have end faces *19* and *20*, respectively, which act as abutments to lock the shank in position in an apertured panel. The skirt *13* of the stud portion *10* is resilient and frusto-conical, surrounding the adjacent portion of the stem *15* and terminating in the plane of or just short of the abutment faces *19*, *20*. The connecting element *14* is generally spherical but is divided by a slot *21* into two compressible portions *22* and *23*.

In use, the stud portion *10* may be mounted in a vehicle panel *25*, which is formed with a circular hole *26*, by pressing the shank *12* through the hole *26* until the legs *17* and *18* snap through the hole and the surfaces *19* and *20* abut the undersurface of the panel *25*. In this condition, the skirt *13* is flattened slightly against the outer surface of the panel *25* and forms a seal around the hole *26*. The abutment faces *19* and *20* lock behind the panel *25* so that the stud portion *10* cannot be removed from the panel without damaging or breaking the shank *12*.

The socket portion *11* comprises a cylindrical bush *27* formed with a cylindrical through bore *28* terminating in a smaller diameter cylindrical rib *34* which defines a constricted bore portion. The diameter of the bore *28* is equal to or slightly larger than the maximum diameter of the spherical connecting element *14* of the stud portion, the diameter of the rib *34* which defines the constricted portion being smaller than the maximum diameter of the connecting element. Externally, the socket portion *11* is formed with an outer circumferential flange *29* and an inner circumferential flange *30*. The bore *28* has a conically flared entry *31* which is formed in the inner flange *30*, the maximum diameter of the conical entry being substantially greater than the maximum diameter of the connecting element.

The vehicle trim pad *32* is provided with a plurality of key-hole slots *33* and a socket portion is mounted in each of these slots. The key-hole slots may be generally as shown in *Figure 16* of British Patent Specification 1,036,423 having a large circular hole

and a small circular hole interconnected by a slot.

These slots are desirably dimensioned in relation to the socket portions *11* such that the large hole is of greater diameter than the flange *29*, and the small diameter hole is of slightly greater diameter than the neck *27*, to allow a sufficient degree of tolerance.

Each socket portion *11* is fitted in a key-hole slot *33*, by inserting the outer flange *29* of the socket portion through the larger hole of the key-hole slot and then sliding the socket portion along the key-hole slot into the smaller hole. The slot interconnecting the two holes is desirably slightly smaller in width than the neck *27*, so that once the socket portion *11* has been forced into the smaller hole it is trapped in place, and retained by flanges *29* and *30*.

The vehicle panel *25* on which the trim pad is to be mounted is also formed with a plurality of holes *26* in each of which a stud portion *10* is mounted. In order to mount the trim pad on the support panel the trim pad is brought up to the support panel *25* and the socket portions *11* are aligned with the connecting elements *14* of the stud portions *10*. The trim pad is then pressed home against the panel *25* so that the connecting element of each stud portion enters the flared entry end of the corresponding bore of each socket element where it is a snap fit through the small diameter bore formed by rib *34*. The trim pad is thereafter retained in position by the frictional resistance created by the rib *34* gripping around the neck portion of connecting element *14*.

Alternatively the assembly of stud portion and socket portion may be supplied to the customer attached together. The customer may then fit the assemblies to the trim pad and thereafter fit the trim pad to the panel by means of the shanks *12*.

It at any time it is necessary to remove the trim pad from the panel *25* this can be done by providing sufficient withdrawal force ("peel force") on the trim pad to overcome the frictional resistance of the connecting elements and force the trim pad away from the panel.

In the assembly operation of the trim pad to the panel, it will be seen that the flared entry *31* to the bore in each socket portion provides a means of guiding the socket portion and aligning it with the connecting element of the stud portion. There is a limited play between the socket portion and the trim pad *32* so that the socket portion will automatically move into correct alignment with the connecting element of the stud portion during this assembly operation.

In some applications it may be desirable to provide for tension between the socket portion and the trim pad so as to eliminate vibration in which case the socket portion may be modified as shown in *Figure 8*. In *Figure 8* a socket portion is indicated generally at *40* having an inner flange *41* which includes a flexible skirt *42* which is flared towards the outer flange *43* and which will flatten against the trim pad so as to tension and clamp the trim pad against the outer flange *43*.

In other applications, it may be desirable to provide for a more controlled retention of the socket portion on the connecting element of the stud portion, in which case it may be advantageous to

form the constricted portion of internal retaining tongues. A socket portion modified in this way is indicated generally at 50 in Figures 9 and 10. The socket portion 50 has an internal bore 51 and is provided also with internal resilient tongues 52 within the bore 51 which are directed away from the flared entry of the bore towards the outer end of the bore. When the socket portion 50 is mounted on the connecting element of the stud portion, the flexible tongues 52 are forced radially outwardly until they pass beyond the point of maximum diameter of the connecting elements whereupon they locate behind the connecting element and resist withdrawal of the socket portion therefrom.

If the socket portion is provided with resilient tongues as in the socket portion 50, it may be desirable to reduce the compressibility of the connecting element, in which case the connecting element may be formed with an axial bore or, alternatively, may be made in the form of a solid ball or sphere.

A further embodiment of the present invention comprises a stud portion 60 and a socket portion 61 which are shown in Figure 11. The stud portion 60 is similar to the stud portion 10 of Figures 1 to 7 and has a generally spherical connecting element 62, which may be solid or split into two portions, as in Figures 1 to 7, or formed with an axial bore to increase its compressibility.

The socket portion 61 comprises a cylindrical bush 63 having a cylindrical through bore 64, an internal rib 65 forming a constricted portion in the bore and a conical flared entry end 66. Externally the socket portion is provided with a single outer circumferential flange 67 at the opposite end of the bush to the entry end 66 which is also flared externally.

In use, the stud portion 60 is mounted in a hole 68 in the support panel 69, as in Figure 6. A second member 70, which may comprise a vehicle floor mat, is provided with a plurality of apertures 71 positioned to coincide with the projecting connecting elements 62. A socket portion 61 is mounted in each aperture 71 by deforming and stretching the aperture slightly to force the flared end 66 through the aperture. The floor mat 70 is then brought up to the panel 69 and each socket portion is pressed home onto a connecting element 62 until the connecting element has been forced past the rib 65. Each socket is then securely mounted on a connecting element to attach the floor mat 70 to the support panel.

Thereafter the floor mat 70 can be peeled away from the support panel by applying a sufficient pull off force to overcome the frictional grip exerted on the connecting elements 62 by the socket portions 61.

It will be seen from the above that we have provided a fastener which is particularly suitable for attaching a trim pad to a support panel of a vehicle in such a manner that the trim pad can be quickly and easily mounted on the support panel, is securely held in place but can be readily removed and re-applied a great number of times without the risk of damage to either the trim pad or the fasteners themselves.

It will also be seen that we have provided a fastener which allows for substantial tolerance in the

positioning of the holes in the support panel in relation to the slots in the trim pad, and which also allows for some inaccuracy in the diameter and shape of the holes provided in the support panel without the risk of insecure mounting or damage to the fasteners when the trim pad is applied to or removed from the support panel.

#### CLAIMS

1. A two-part fastener comprising a stud portion and a socket portion, the stud portion having attachment means for attaching the stud portion to a first panel member and a connecting element and the socket portion having a bore adapted to receive the connecting element and attachment means for attaching the socket portion to a second member, wherein the connecting element is generally spherical, the bore in the socket portion has a constricted portion and the maximum diameter of the connecting element is greater than the minimum diameter of the constricted portion of the bore so that the connecting element is a force fit in the bore.

2. A fastener as claimed in claim 1, wherein the bore in the socket portion has a generally cone shaped entrance, the maximum diameter of which is greater than the maximum diameter of the connecting element.

3. A fastener as claimed in claim 1 or claim 2, wherein the connecting element is resiliently compressible.

4. A fastener as claimed in claim 3, wherein the connecting element is divided by a slot into two resiliently deflectable portions.

5. A fastener as claimed in claim 3, wherein the connecting element is formed with an axially extending bore.

6. A fastener as claimed in any preceding claim, wherein the constricted portion of the bore in the socket portion is resiliently expansible.

7. A fastener as claimed in any preceding claim, wherein the attachment means on the socket portion comprises a flange adapted to limit insertion of the socket portion through an aperture in the second member.

8. A fastener as claimed in any of claims 1 to 6, wherein the attachment means on the socket comprises two spaced flanges adapted to slideably mount the socket portion in a slot in the second member.

9. A fastener as claimed in any preceding claim, wherein the attachment means on the stud comprises a shank adapted for insertion through an aperture in the first panel member and a flange adapted to limit insertion of the shank through the aperture.

10. A fastener as claimed in claim 9, wherein the shank is adapted to be non-removable from the aperture in the first panel member.

11. A fastener as claimed in any preceding claim, wherein the stud portion and the socket portion are initially joined by frangible web elements.

12. A fastener as claimed in claim 9, wherein the connecting element is connected to the flange on the stud portion by a necked portion of substantially smaller diameter than the maximum diameter of the

connecting element.

13. A two part fastener assembly substantially as described herein with reference to the accompanying drawings.

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